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Lewis Research Center



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DESIGN CRITERIA MONOGRAPH FOR HIGH-LOAD HIGH-SPEED ROLLING-CONTACT BEARINGS

A design criteria monograph has been published which summarizes and systematically orders the large body of successful techniques and practices developed for the design of liquid rocket engine turbopump bearings.

This monograph was written to organize and present, for effective use in design, the significant experience and knowledge accumulated by NASA in development and operational programs. It reviews and assesses current design practices, and from them establishes firm guidance for achieving greater consistency in design, increased reliability in the end product and greater efficiency in the design effort.

The successful development of rolling-contact bearings for liquid rocket engine turbopumps presented many problems. Since conventional bearings and lubricants could not be used, a number of approaches and techniques had to be explored in order to solve these problems. These same techniques may also be of value in solving other bearing and lubricant problems.

Some representative problem areas and solutions were:

1. Use of self-lubricating cage materials within the bearing.
2. Use of non-lubricants for cooling and for maintaining a satisfactory heat balance.
3. Quality control procedures for a variety of new bearing materials.
4. Dimensional stabilization procedures for bearing materials used in applications involving extreme temperature ranges.

The monograph comprises two major sections: State of the Art, and Design Criteria and Recommended Practices. References complement the text.

The State of the Art reviews and discusses the total design problem, and identifies the design elements that are involved in successful design. The Design Criteria state clearly and briefly each rule, guide, limitation, or standard that must be imposed on each essential design element to ensure successful design; the Recommended Practices set forth the best available procedures for satisfying the Design Criteria.

Both major sections are divided into two subject categories: bearing assembly design and bearing component design. Bearing assembly design is subdivided into load capability, speed capability, stiffness, misalignment tolerance, bore, internal clearance, cooling, bearing mounting, bearing materials, and testing. The bearing component design categories are rolling element design, race design, and cage design.

This thorough review of design criteria and practices related to rolling contact bearings is useful for a wide range of bearing applications.

NOTES:

1. The following documentation may be obtained from:
National Technical Information Service
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.95)
Reference: NASA SP-8048 (N71-28011), Liquid Rocket Engine Turbopump Bearings
2. Technical questions may be directed to:
Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135
Reference: B72-10627

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